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10/563,357	06/12/2006	Youji Shibahara	2005_2041A	8845

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EXAMINER	
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ART UNIT	**PAPER NUMBER**
2482	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/563,357	Applicant(s) SHIBAHARA ET AL.	
	Examiner CHIKAODILI E. ANYIKIRE	Art Unit 2482	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *38-55,72,75 and 78-96* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *38-55,72, 75, and 78-96* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. This application is responsive to application number (10/563357) filed on June 24, 2006. Claims 38-55, 72, 75, and 78-96 are pending and have been examined.

Claim Rejections - 35 USC § 103

2. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 38-55, 72, 75, and 78-96 rejected under 35 U.S.C. 103(a) as being unpatentable over Sung et al (US 2005/0018772, hereafter Sung) in view of Aono et al (US 5,859,668).

As per **claim 38**, Sung discloses a coding mode determining apparatus for determining at least one of a plurality of candidate coding modes of an image block, the coding mode determining comprising:

a simple motion estimation portion that derives a first coding cost for each of the plurality of coding modes, based on a simple motion estimation for small blocks, the small motion blocks being partitions of the image block obtained using each of the plurality of coding modes;

a coding mode selecting portion that selects a subset of the plurality of coding modes, based on the first coding cost derived for each of the plurality of coding modes by the simple motion estimation portion;

a complex motion estimation portion that derives a second coding cost for each of the plurality of coding modes, based on a complex motion estimation for the small blocks obtained using at least a subset of the selected subset of the plurality of coding modes; and

a coding mode determining portion that determines, from the plurality of coding modes, a coding mode of the image block, the coding mode being determined based on the second coding cost derived for each of the plurality of coding modes by the complex motion estimation portion (paragraphs [0045] lines 1 – 6 and [0048] lines 15 – 26; Sung discloses that a SAD as the coding cost and that it starts with an integer pixel resolution (simple motion estimation) and sent to a refiner (complex motion estimation) for sub-pixel resolution).wherein the complex motion estimation portion determines a picture reference direction used in the complex motion estimation, the picture reference direction being determined based on the simple motion estimation, and the picture reference direction being a prediction direction, and wherein, based on the simple motion estimation for the small blocks, the complex motion estimation portion derives the second coding cost (i) by selecting both a forward prediction direction and a backward prediction direction, when both the forward prediction direction and the backward prediction direction result in substantially a same coding cost, and (ii) by selecting one of the forward direction and the backward prediction direction resulting in

a small coding cost, when the forward prediction direction and the backward prediction direction result in a different coding cost.

However, Sung does not explicitly teach wherein the complex motion estimation portion determines a picture reference direction used in the complex motion estimation, the picture reference direction being determined based on the simple motion estimation, and the picture reference direction being a prediction direction, and wherein, based on the simple motion estimation for the small blocks, the complex motion estimation portion derives the second coding cost (i) by selecting both a forward prediction direction and a backward prediction direction, when both the forward prediction direction and the backward prediction direction result in substantially a same coding cost, and (ii) by selecting one of the forward direction and the backward prediction direction resulting in a small coding cost, when the forward prediction direction and the backward prediction direction result in a different coding cost.

In the same field of endeavor, Aono discloses wherein the complex motion estimation portion determines a picture reference direction used in the complex motion estimation, the picture reference direction being determined based on the simple motion estimation, and the picture reference direction being a prediction direction, and wherein, based on the simple motion estimation for the small blocks, the complex motion estimation portion derives the second coding cost (i) by selecting both a forward prediction direction and a backward prediction direction, when both the forward prediction direction and the backward prediction direction result in substantially a same coding cost, and (ii) by selecting one of the forward direction and the backward

prediction direction resulting in a small coding cost, when the forward prediction direction and the backward prediction direction result in a different coding cost (column 8 lines 31-55).

Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to modify the invention of Sung in view of Aono. The advantage is finding the optimum prediction mode (column 8 lines 53-56).

As per **claim 39**, Sung discloses the coding mode determining apparatus according to claim 38, wherein, when deriving the first coding cost of each of the plurality of coding modes, the simple motion estimation portion performs the simple motion estimation in a plurality of picture reference directions on each of the small blocks obtained using each of the plurality of coding modes to calculate a coding cost, then (ii) selects a picture reference direction having a lowest coding cost for each individual small block, then (iii) sums up the first coding costs derived for all of the small blocks relating to the selected picture reference direction for each of candidate division methods individually to derive the first coding cost of the coding mode of each of the candidate division methods (paragraphs [0048] lines 15—26, [0053], and [0054]).

As per **claim 40**, Sung discloses the coding mode determining apparatus according to claim 38, wherein, when deriving the first coding cost of each of the plurality of coding modes, the simple motion estimation portion performs a simple motion estimation in a plurality of picture reference directions on each of the small blocks obtained with each of the coding modes to calculate a coding cost, then converts

the coding cost of each of the small blocks for each picture reference direction individually into a coding cost per image block to derive a coding cost of the coding mode of each of candidate division methods for each of the reference directions (paragraph [0042]; the picture types describe the reference direction for motion estimation).

As per **claim 41**, Sung discloses the coding mode determining apparatus according to claim 39, wherein the simple motion estimation in the plurality of picture reference directions in the simple motion estimation portion includes only the forward prediction direction in which a temporally preceding picture is referenced, and backward prediction direction in which a temporally following picture is referenced (paragraph [0042]).

Regarding **claim 42**, arguments analogous to those presented for claim 41 are applicable for claim 42.

As per **claim 43**, The coding mode determining apparatus according to claim 39, wherein the simple motion estimation in the plurality of picture reference directions in the simple motion estimation portion includes forward prediction in which a temporally preceding picture is referenced, the backward prediction in which a temporally following picture is referenced, and a bi-directional prediction direction in which pictures that are on both sides in time are referenced (paragraph [0042]).

Regarding **claim 44**, arguments analogous to those presented for claim 43 are applicable for claim 44.

As per **claim 45**, Sung discloses the coding mode determining apparatus according to claim 39, wherein the simple motion estimation in a plurality of picture reference directions in the simple motion estimation portion includes forward prediction in which a temporally preceding picture is referenced, and backward prediction in which a temporally following picture is referenced, and wherein the simple motion estimation portion derives a coding cost where bi-directional prediction in which pictures that are on both sides in time are referenced is performed, based on the forward prediction and the backward prediction (paragraphs [0042] and [0044]).

Regarding **claim 46**, arguments analogous to those presented for claim 45 are applicable for claim 46.

As per **claim 49**, Sung discloses the coding mode determining apparatus according to claim 38, wherein the complex motion estimation portion selects at least a further subset of the selected subset of the plurality of coding modes, based on the simple motion estimation for the small blocks (paragraph [0048]).

As per **claim 50**, Sung discloses the coding mode determining apparatus according to claim 49, wherein the complex motion estimation portion (i) selects each of the plurality of coding modes in an ascending order of the first coding cost, (ii) derives the second coding cost by repeatedly selecting coding modes of the plurality of coding modes in the ascending order of the first coding cost, while a sum of a processing amount of the selected coding mode does not exceed a margin for the processing amount, and (iii) stops selecting coding modes when the sum of the processing amount

of the selected coding modes exceeds the margin for the processing amount, and does not derive the second coding cost after a time when the sum of the processing amount of the selected coding modes exceeds the margin for the processing amount (paragraph [0048]).

As per **claim 51**, Sung discloses the coding mode determining apparatus according to claim 38, wherein the simple motion estimation portion changes, depending on an image attribute, a method of motion estimation in the simple motion estimation in such a manner that a processing amount for the simple motion estimation remains substantially constant (paragraphs [0041], [0042], and [0048]).

As per **claim 52**, Sung discloses the coding mode determining apparatus according to claim 38, wherein the simple motion estimation is motion estimation having integer pixel accuracy, and wherein the complex motion estimation is motion estimation having non-integer pixel accuracy (paragraph [0048]).

As per **claim 53**, Sung discloses an integrated circuit comprising the coding mode determining apparatus according to claim 38 (paragraph [0055]).

As per **claim 54**, Sung discloses an image coding apparatus comprising: the coding mode determining apparatus according to claim 38; and a coding apparatus that codes an image block, based on a coding mode of the image block that is determined by the coding mode determining apparatus (paragraph [0048]).

As per **claim 55**, Sung discloses an integrated circuit comprising the image coding apparatus according to claim 54 (paragraph [0055]).

Regarding **claim 72**, arguments analogous to those presented for claim 38 are applicable for claim 72.

Regarding **claim 75**, arguments analogous to those presented for claim 38 are applicable for claim 75.

As per **claim 78**, the coding mode determining apparatus according to claim 38, wherein the complex motion estimation portion performs the complex motion estimation by selecting each of the plurality of coding modes (i) in an ascending order of the first coding cost and (ii) within a range in which a sum of a processing amount of the plurality of coding modes does not exceed an allowable value of the image block (paragraph [0042]).

As per **claim 79**, Sung disclose the coding mode determining apparatus according to claim 78, wherein the processing amount is determined, such that the processing amount is proportional to a pixel number of a small block of the image block (paragraphs [0042]; Sung shows that explains that the encoding speed is proportional to the type of frame which is related to the number of pixels within each frame).

As per **claim 80**, Sung discloses the coding mode determining apparatus according to claim 78, wherein the processing amount is determined, such that the processing amount is proportional to a number of picture reference directions (paragraph [0042]; Sung explains that the type of frame determines the processing amount which relates to the number of picture reference directions).

As per **claim 81**, Sung discloses the coding mode determining apparatus according to claim 80, wherein the processing amount is determined, such that the

processing amount is proportional to the number of picture reference directions derived by:

not counting picture reference directions when the simple motion estimation in the plurality of picture reference directions is performed through a bi-directional prediction direction, in which pictures that are on both sides in time are referenced; and counting picture reference directions when the simple motion estimation in the plurality of picture reference directions is performed through a prediction direction, other than the bi-directional prediction direction in which pictures that are on both sides in time are referenced (paragraph [0042]).

As per **claim 82**, Sung discloses the coding mode determining apparatus according to claim 38, wherein the complex motion estimation portion changes, depending on an image attribute, a method of motion estimation in the complex motion estimation in such a manner that a processing amount for the complex motion estimation remains substantially constant (paragraph [0042]).

As per **claim 83**, Sung discloses the coding mode determining apparatus according to claim 38, wherein the simple motion estimation portion and the complex motion estimation portion respectively change, depending on an image attribute, a method of motion estimation in such a manner that a sum of a processing amount for the simple motion estimation by the simple motion estimation portion and a processing amount for the complex motion estimation by the complex motion estimation portion remains substantially constant (paragraph [0042])

As per **claim 84**, Sung discloses the coding mode determining apparatus according to claim 51, wherein the image attribute is at least one of (i) a size of the image block, (ii) a coding method for a picture type, including I-picture, P-picture, and B-picture, of the image block, (iii) a format for a scanning method, including progressive and interlaced, and a chroma format of the image block, and (iv) a motion amount of the image block (paragraph [0042]; the image attribute is the coding method for a picture type).

Regarding **claim 85**, arguments analogous to those presented for claim 84 are applicable for claim 85.

Regarding **claim 86**, arguments analogous to those presented for claim 84 are applicable for claim 86.

As per **claim 87**, Sung discloses the coding mode determining apparatus according to claim 84, wherein at least one of the simple motion estimation portion and the complex motion estimation portion changes a method of motion estimation in the simple motion estimation and the complex motion estimation, such that a product of a size of an input image constituted by the image block, a number of reference pictures and a number of partition sizes remain substantially constant (paragraph [0044]).

As per **claim 88**, Sung discloses the coding mode determining apparatus according to claim 84, wherein at least one of the simple motion estimation portion and the complex motion estimation portion renders a number of reference pictures for B-pictures smaller than those for P-pictures, such that the processing amount for the

simple motion estimation and the complex motion estimation for each picture remains substantially constant (paragraph [0042]).

As per **claim 89**, Sung discloses the coding mode determining apparatus according to claim 84, wherein at least one of the simple motion estimation portion and the complex motion estimation portion keeps the processing amount for the simple motion estimation and the complex motion estimation constant for each picture through one of the following:

at least one of the simple motion estimation portion and the complex motion estimation portion references a preceding four pictures for P-pictures, and references a preceding two pictures and a subsequent two pictures for B-pictures;

at least one of the simple motion estimation portion and the complex motion estimation portion references a preceding three pictures for P-pictures, and references a preceding two pictures and a subsequent one picture for B-pictures; and

at least one of the simple motion estimation portion and the complex motion estimation portion references a preceding two pictures for P-pictures, and references a preceding one picture and a subsequent one picture for B-pictures (paragraph [0042]).

As per **claim 90**, Sung discloses the coding mode determining apparatus according to claim 84, wherein at least one of the simple motion estimation portion and the complex motion estimation portion renders a number of partition sizes of B-pictures smaller than that of P-pictures, such that the processing amount for the simple motion estimation and the complex motion estimation for each picture remains substantially constant (paragraph [0042]).

As per **claim 91**, Sung discloses the coding mode determining apparatus according to claim 84, wherein at least one of the simple motion estimation portion and the complex motion estimation portion keeps the processing amount for the simple motion estimation and the complex motion estimation constant for each picture through one of the following:

at least one of the simple motion estimation portion and the complex motion estimation portion (A) references a preceding one picture for P-pictures, and performs a prediction for four partition sizes of 16x16, 16x8, 8x16 and 8x8, and (B) selects two of the above-described four partition sizes for B-pictures, and performs forward prediction and backward prediction for both of the selected two; and at least one of the simple motion estimation portion and the complex motion estimation portion (C) references a subsequent one picture for P-pictures, and performs a prediction for four partition sizes of 16x16, 16x8, 8x16 and 8x8, and (D) selects two of the above-described four partition sizes for B-pictures, and performs forward prediction and backward prediction for both of the selected two (paragraph [0055]).

As per **claim 92**, Sung discloses the coding mode determining apparatus according to claim 84, wherein at least one of the simple motion estimation portion and the complex motion estimation portion renders a number of reference pictures or a number of partition sizes when an input image is an interlaced image smaller than the number of reference pictures or the number of partition sizes when the input image is a progressive image (paragraph [0055]).

As per **claim 93**, Sung discloses the coding mode determining apparatus according to claim 84, wherein at least one of the simple motion estimation portion and the complex motion estimation portion:

in a case of P-pictures, references a preceding two frames for progressive P-pictures, and references a preceding two fields for interlaced P-pictures; and in the case of P-pictures, (A) references a preceding one frame for progressive P-pictures, and performs a prediction for each of four types of partition sizes of 16x16, 16x8, 8x16 and 8x8, and (B) references a preceding two fields for interlaced P-pictures, and performs a prediction for two types of the partition sizes for each of selected two partition sizes (paragraph [0055]).

As per **claim 94**, Sung discloses the coding mode determining apparatus according to claim 84, wherein at least one of the simple motion estimation portion and the complex motion estimation portion changes a number of reference pictures or a number of partition sizes, in accordance with a motion of the image block (paragraph [0055]).

As per **claim 95**, Sung discloses the coding mode determining apparatus according to claim 50, wherein the processing amount is determined, such that the processing amount is proportional to a pixel number of a small block of the image block (paragraph [0042]).

As per **claim 96**, Sung discloses the coding mode determining apparatus according to claim 50, wherein the processing amount is determined, such that the

processing amount is proportional to a number of picture reference directions (paragraph [0042]).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHIKAODILI E. ANYIKIRE whose telephone number is (571)270-1445. The examiner can normally be reached on Monday to Friday, 7:30 am to 5 pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris Kelley can be reached on (571) 272 - 7331. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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